

REMARKS / ARGUMENTS

Reconsideration of the application is requested.

Claims 1, 3-5, 11-15, 17-21, and 23 remain in the application. Claims 1, 3, 17, and 23 have been amended. Claims 2, 6-10, 16, 22, and 24-25 have been cancelled. Claims 11-12 and 18 have been withdrawn.

Independent claims 1 and 3 have been amended in an effort to even more clearly define the invention of the instant application. Support for the changes is found in original claim 2 as well as the drawings and the corresponding description of the specification.

The contacts of Akagawa et al. have a limited ability to withstand mechanical stress before failing. The object of the invention of the instant application is to provide a chip which displays an improved mechanical decoupling when, for example, the chip is soldered to a printed circuit board.

The concept used in the invention of the instant application in order to improve the mechanical decoupling of the chip from the printed circuit board is different from that envisaged by Akagawa et al. The concept and structure of the invention of the instant application is not obvious from the disclosure of

Akagawa et al. as well as in combination with other cited prior art documents.

As can be seen from Fig. 1 of Akagawa et al., a first insulating layer 38 is provided between the passivation layer 34 and the circuit pattern 40. A second insulating layer 42 is provided on the circuit pattern 40 and the insulating layer 38. Akagawa et al. indicate in column 10, lines 48-51, that the insulating layers 38 and 42 can act as a shock-absorbing layer. As can be seen in Fig. 1, for example, the layers 38 and 42 are quite thin.

The structure taught by Akagawa et al. has a limited ability to absorb mechanical stress on the external contacts 46. The contacts of Akagawa et al. have the disadvantage that mechanical stress on the solder ball 46 is largely transferred to the circuit pattern 40. This causes the delamination of the circuit pattern 40 from the first insulating layer 38 and failure of the contact. The insulating layer 42 is provided laterally outside of the interface of the solder ball 46 with the interconnect 40 and, therefore, plays little role in absorbing mechanical stress.

The improved mechanical decoupling provided by the structure of the invention of the instant application is based on the

realization that a more reliable chip can be provided by a structure in which the external contacts, such as electrically conductive balls, are more effectively mechanically decoupled from, while remaining in good electrical contact with, the interconnect structure.

This is achieved according to the invention of the instant application by positioning elastic material between the contact ball and the metallic interconnect, namely by the provision of an elastic electrically conductive cylinder between the contact ball and the interconnect, rather than behind and adjacent the interconnect as taught by Akagawa et al.

As can be seen in Fig. 9 of the instant application, the interconnects (5) of the chip (1) are positioned on the passivation layer (3), and a further passivation layer (6) and an insulating layer (8) are provided on top of the interconnects (5). Openings are provided in the layers (6, 8) which form the electrical connection between the base regions of the interconnects (5) and the contact ball (13) when filled with electrically conductive elastic material. The insulating layer (8) has a thickness which is at least four times that of the passivation layer (3), thus forming a cylinder opening above the base regions of the interconnect. Improved

mechanical decoupling between the contact ball and the interconnect is achieved by the cylinder of electrically conductive material which has an elasticity and is placed in the openings in the second passivation layer (6) and the insulating layer (8). This structure is not obvious from Akagawa et al. in combination with Akram et al. or IBM Technical Bulletin. There is no suggestion in the disclosure of Akagawa et al. that would lead a person skilled in the art to the provision of an elastic cylinder between the interconnect and the solder ball.

Akram et al. teach an interposer and there is no hint in the disclosure of Akram et al. that would lead a person skilled in the art to identifying the problem of the prior art chip contacts of Akagawa et al. or the concept of the invention of the instant application.

It is accordingly believed to be clear that none of the references, whether taken alone or in any combination, either show or suggest the features of claims 1 and 3. Claims 1 and 3 are, therefore, believed to be patentable over the art and since all of the dependent claims are ultimately dependent on claims 1 or 3, they are believed to be patentable as well.

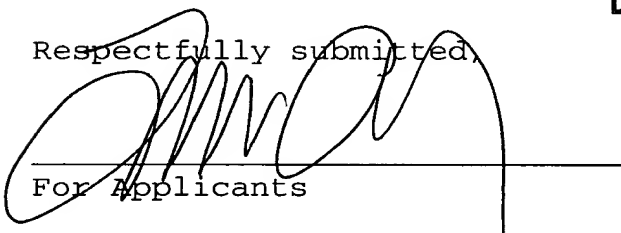
In view of the foregoing, reconsideration and allowance of claims 1, 3-5, 13-15, 17, 19-21, and 23 are solicited.

In the event the Examiner should still find any of the claims to be unpatentable, counsel would appreciate a telephone call so that, if possible, patentable language can be worked out.

If an extension of time for this paper is required, petition for extension is herewith made. Please charge any fees which might be due with respect to 37 CFR Sections 1.16 and 1.17 to the Deposit Account of Lerner and Greenberg, P.A., No. 12-1099.

Respectfully submitted,

LAURENCE A. GREENBERG
REG. NO. 29,308


For Applicants

YC

June 10, 2004

Lerner and Greenberg, P.A.
Post Office Box 2480
Hollywood, FL 33022-2480
Tel: (954) 925-1100
Fax: (954) 925-1101